U. S. DEPARTMENT OF AGRICULTURE - FOREST SERVICE
CALIFORNIA FOREST AND RANGE EXPERIMENT STATION
Division of Forest Insect Research

MOUNTAIN PINE BEETLE SKUNK CABBAGE CREEK MODOC NATIONAL FOREST APPRAISAL SURVEY SEPTEMBER 1956

Introduction

An appraisal survey was conducted of an outbreak of mountain pine beetle in lodgepole pine on the Modoc National Forest during the week of September 24-28, 1956. C. B. Eaton, G. C. Trostle and B. E. Wickman, all of the California Forest and Range Experiment Station, took part in the survey.

The infestation is in the Surprise Valley District; specifically in the upper Skunk Cabbage, Alaska, and south fork of East Creek drainages of the South Warner Mountains. It was first reported by Modoc National Forest officers in August 1956. Subsequently, C. B. Eaton and B. E. Wickman, accompanied by H. J. Taylor, District Ranger, and R. H. Cron from the Forest Supervisor's office, made a reconnaissance survey of the outbreak area. The reconnaissance was conducted in late August as part of the annual fall insect survey of the Modoc National Forest. At that time hundreds of lodgepole pine infested with heavy broods of mountain pine beetle were found in large groups over an area estimated at 1,000 acres. There were so many 1955 killed lodgepole pine in the area that from a distance the stand had a brown coloring, as if swept by fire. On September 17, B. E. Wickman made an aerial survey of the outbreak, delineating its boundaries on aerial photos. This survey indicated that the zone of infestation covered 2,212 acres instead of 1,000. Aerial photographs of the infested stand, showing the damage, were taken at that time. Because of the size and intensity of the infestation, an appraisal survey was requested by the Modoc National Forest.

Insect and Host Species

The mountain pine beetle, Dendroctonus monticolae Hopk., is attacking and killing lodgepole pine, western white pine, and white-barked pine. The stand is pure lodgepole pine type with a scattering of western white pine and white-barked pine on the ridges. It is of mature age, probably 100-150 years old. The average diameter breast high is about 14 inches, with some trees 40 inches in diameter in the watered draws.

Current Status

The infestation area was sampled with a series of 1/4-acre circular plots and several 1/16-acre plots which were compensated for in the statistical analysis. The plots were 5 chains center to center

on a predetermined line. Lines were 10 chains apart, parallel and running north and south. On all of the plots the following information was recorded: (1) Number of trees currently infested with mountain pine beetle and diameter of each; (2) number of abandoned trees (1955 kills) and diameter of each; (3) number of trees dead for 2-5 years and diameter of each. In this category there were some plots with so many dead trees that the total number on the plot was counted, then an average diameter estimated for the group. The lower diameter limit sampled was 6 inches. Smaller trees were estimated to the nearest 2 inch class and large trees (18 inches and over) were measured to the nearest 2 inch diameter class. A total of 353 plots, or 88-1/4 acres was sampled in this manner.1/ Because most of the trees sampled were in a diameter class under the minimum found in board-foot volume tables, total volume was taken in cubic feet and board-foot volume was used only for diameters 12 inches and over. The following table shows the estimated total amount of damage caused by the mountain pine beetle and the estimated loss in the zone of heaviest infestation.

Estimated Total Loss from Mountain Pine Beetle

Year of kill	Average no. trees/ac. and standard error	Sampling error (Percent)	Average diameter (Inches)	Average vol./ac. (Cubic feet)	Average vol./ac. trees 12" and over (Board feet)
THE WHOLE AREA					
Currently infested	6.4 ± 1.16	18.1	14	130.8	381.0
Abandoned	6.4 ± .95	14.8	13	122.9	288.7
Total 5-year loss	24.5 ± 2.90	11.8	14	555.3	1,597.5
ZONE OF HEAVIEST INFESTATION					
Currently infested	25.1 ± 4.68	18.7	13	412.2	1,039.5
Abandoned	22.4 ± 3.62	16.2	12	302.8	460.3
Total 5-year loss	83.6 ± 9.27	11.1	12	1,383.8	2,817.1

1/ Study plan for the appraisal of the Skunk Cabbage Creek Mountain Pine Beetle infestation, Modoc National Forest, September 1956, B. E. Wickman.

The table indicates that loss per acre is extremely severe on the zone of heaviest infestation, approximately 25 infested trees per acre with a volume of 1,039.5 board-feet per acre. The zone of heaviest infestation is comprised of 495 acres on the ridge just south of Skunk Cabbage Creek. (See map) A striking situation in this zone is that there were some plots sampled with only several live trees per plot. The zone of heaviest infestation was delineated by marking on the map all plots with 6 or more currently infested trees; from this a definite pattern of heavy infestation was evident and could be mapped as a zone.

The loss for the total area of 2,212 acres is no less serious. Six trees per acre can also be considered as serious stand depletion, but the area surrounding the zone of heaviest infestation is characterized by scattered, heavy group loss. The focus of infestation appears to be spreading outward every year and there seems to be very little prospect that the infestation will stop until the beetles run out of green trees to attack. Table 1 shows that the epidemic is definitely on an upward trend, with the currently-infested volume greater than that of the abandoned trees or 1955 loss. This indicates that the beetles attacked more and larger trees in 1956. The brood in most of the trees examined was extremely heavy and there was little evidence of natural enemies except for some woodpecker work.

Control Possibilities

There are several possibilities for direct control of the mountain pine beetle in Skunk Cabbage Creek.

One control method would be to remove all infested trees by logging. This could be done if a proposed logging road is built to the area and trees under the 12-inch diameter class can be removed from the woods for utilization at a profit. If only the larger infested trees can be logged, then perhaps the smaller trees could be treated chemically. The other method of control would be by the application of an insecticide to the bark surface of infested trees after they are felled to kill the beetles. There is a possibility that smaller trees could be sprayed standing. A water emulsion of ethylene dibromide would be a satisfactory insecticide.

The spray can be formulated as follows:

85% concentrate EDB	3.25 gallons
Emulsifier (Triton X-100 & B-1956)	1.88 gallons
Diesel oil	15 gallons
Water to make	100 gallons

Or the emulsifiable concentrate can be prepared at a base located in the treating area, and the water can be added as close to

the treating sites as possible. Five-gallon Jeep cans can be used, 3-1/2 quarts of the emulsifiable concentrate put in each can and water added to make 5 gallons.2/ It is estimated from an average diameter of 14 inches that 5 gallons of spray will be sufficient for each tree. The spray can be applied with a stirrup-type hand pump directly from the Jeep cans, for standing trees, or applied with a sprinkling can on felled trees.

At the present prices the insecticide would cost $0.265 per gallon. Assuming that there are 14,112 infested trees, and that 5 gallons of insecticide would be required per tree, the cost of insecticide by this method would be approximately $18,698.40. To this would be added costs of labor for spotting and application, and cost of supervision. The total cost of direct control with insecticides would probably be about $130,000. The timing of control is extremely important, for it is necessary to conclude control operations before the adult beetles emerge. Such operations should be completed no later than July 1, 1957.

Discussion

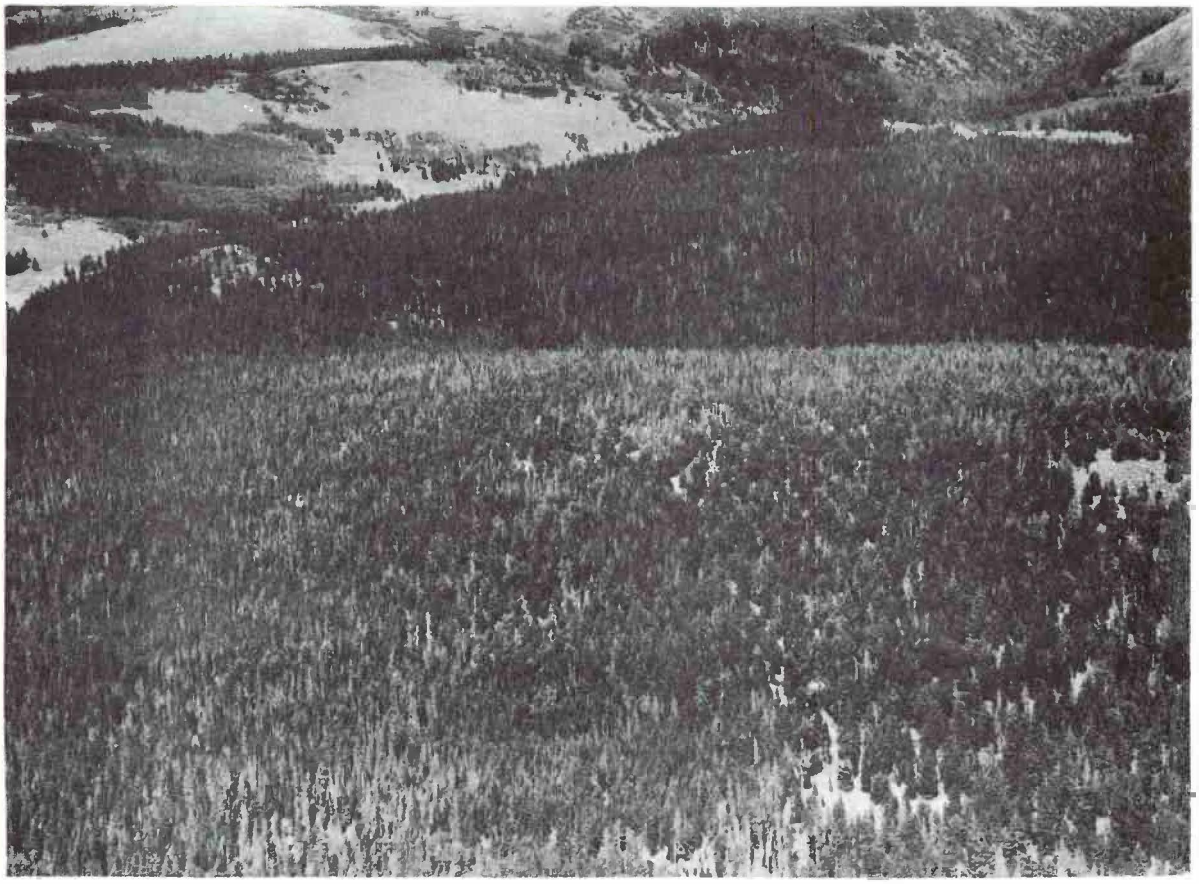
The survey showed that an outbreak of mountain pine beetle in lodgepole pine is destroying a large basin of timber in the South Warner Mountains, Modoc National Forest. At the present rate of attack on green trees, 2,212 acres of lodgepole pine in the Skunk Cabbage basin is threatened with destruction within a few years. Similar outbreaks which occurred in the past at Medicine Lake and Yosemite National Park have created vast areas of dead lodgepole pine aptly named "Ghost Forests."

No natural enemies were noted except for some woodpeckers. However, the chances are very slight that they can contain the epidemic. Two methods of control are possible--logging of infested trees or treatment with a chemical insecticide.

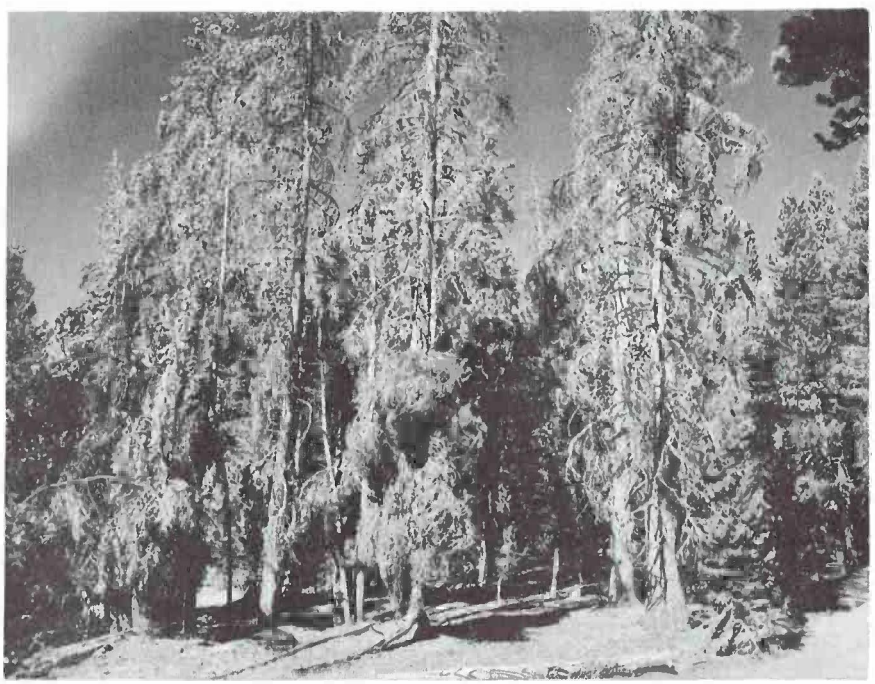
Berkeley, California
January 29, 1957

Boyd E. Wickman
Entomologist

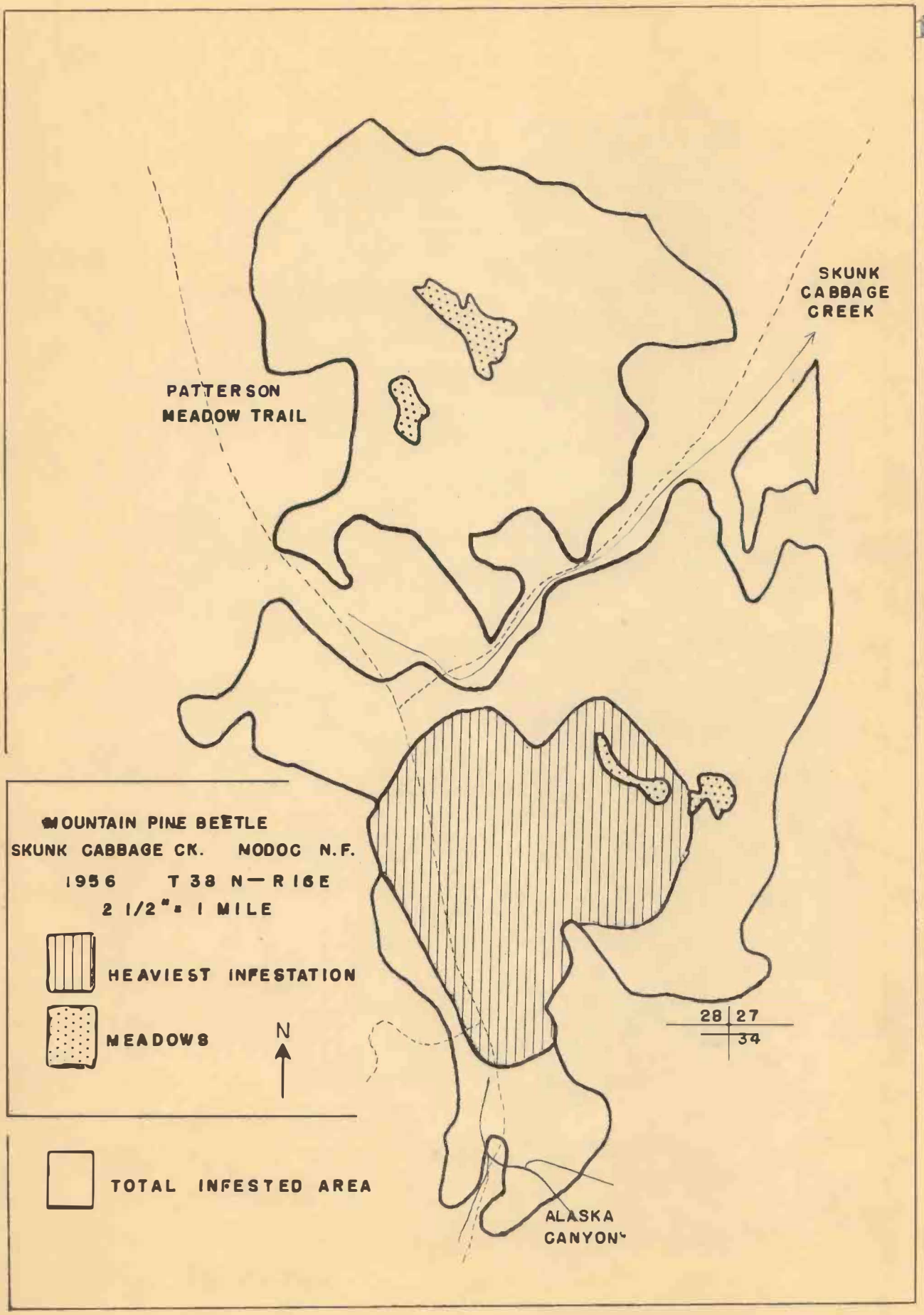
2/ Study Plan for Testing Ethylene Dibromide Emulsion for Control of the Mountain Pine Beetle in Lodgepole Pine. May 1956. By R. E. Stevens.



Aerial view of Skunk Cabbage Infestation. Gray area is lodgepole pine killed by mountain pine beetle on the ridge just south of Skunk Cabbage Creek. (Note scattered loss throughout stand.) Modoc National Forest, September 1956.



A large group of lodgepole pine killed by the mountain pine beetle in 1955. Skunk Cabbage Infestation, Modoc National Forest, September 1956.


SKUNK CABBAGE CREEK
PATTERSON MEADOW TRAIL
MOUNTAIN PINE BEETLE
SKUNK CABBAGE CK. MODOC N.F.
1956 T 38 N — R 16 E
2 1/2" = 1 MILE
HEAVIEST INFESTATION
MEADOWS
N
TOTAL INFESTED AREA
28 27
34
ALASKA CANYON